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PROJECT SPECIFIC PLAN FOR THE AREA 9, PHASE II PRECERTIFICATION REAL-TIME SCAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

FOR INFORMATION ONLY

NOVEMBER 20, 2000

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A1PII	Area 1, Phase II
A9PII	Area 9, Phase II
ASCOC	area-specific constituent of concern
ASL	analytical support level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CU	certification unit
DOE	U.S. Department of Energy
DQO	Data Quality Objectives
FACTS	Fernald Analytical Customer Tracking System
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GIS	Graphical Information System
GPS	Global Positioning System
HPGe	high-purity germanium (detector)
LAN	Local Area Network
mg/kg	milligrams per kilogram
NaI	sodium iodide
pCi/g	picoCuries per gram
PSP	Project Specific Plan
PWID	Project Waste Identification Document
QA/QC	quality assurance/quality control
RA	Removal Action
RMS	Radiation Measurement Systems
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Radiation Tracking System
RWP	Radiological Work Permit
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
STP	Sewage Treatment Plant
TAL	Target Analyte List
V/FCN	Variance/Field Change Notice
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

1.1 BACKGROUND

Soil constituent of concern (COC) data collected during the Fernald Environmental Management Project (FEMP) Remedial Investigation identified areas of soil contamination along the eastern portion of the site within Area 1, Phase I (A1PI) and Area 1, Phase II (A1PII). As a result of this contamination, the U.S. Department of Energy (DOE) plans to certify the portion of the off-property soil adjacent to the FEMP's eastern boundary. Area 9, Phase II (A9PII) is south of A9PI and east of the remediated portion of A1PII. Off-property certification needs to take place after the adjacent portion of the FEMP property is remediated and certified as attaining final remediation levels (FRLs) for all area-specific COCs (ASCOCs). Certification of A1PII was completed in early 2000. A9PII is identified on Figure 1-1.

Based on agreements with the U.S. Environmental Protection Agency and Ohio Environmental Protection Agency, the suite of ASCOCs to be analyzed for certification of off-property soil is identical to the adjacent FEMP soil remediation area. Therefore, the ASCOCs for A9PII are identical to the suite of ASCOCs for A1PII. All ASCOCs will be certified to the more stringent off-property soil FRLs identified in the Operable Unit 5 Record of Decision. The certification strategy for this area will follow Approach E, as specified in the Sitewide Excavation Plan (SEP), because much of the soil in this area has been plowed, thus eliminating the original surface layer of soil. In addition, a portion of the area has been excavated as part of Removal Action (RA) 14 which is identified on Figure 1-2. As a result of this excavation, additional high-purity germanium (HPGe) detector scans will be conducted in conjunction with the mobile NaI detector scans typically conducted during Phase I of precertification. In areas that are inaccessible to the mobile sodium iodide (NaI) detectors, also identified on Figure 1-2, supplemental scanning with the HPGe detector and hand held friskers will be conducted. Other details of the certification strategy for plowed soil are still being planned together with A9PI certification and, when finalized, will be presented in the A9PII Certification Design Letter (CDL).

In addition to providing information to help establish certification unit (CU) boundaries, precertification data will be used to identify any residual patterns of radiological soil contamination. Above-FRL soil that could result in a CU failing certification will be excavated and removed before certification activities begin.

1.2 PURPOSE

The purposes of precertification scanning activities detailed in this Project Specific Plan (PSP) are to: 1) provide information to aid in establishing CU boundaries, 2) evaluate any patterns of residual surface soil contamination, and 3) determine if soil excavation is necessary for the CU to pass certification. In addition, information will be obtained to further evaluate the off-site property adjacent to the former Sewage Treatment Facility (STP), areas excavated for certification of A1PII, and areas in A9PII excavated as part of RA14. Phase 1 and Phase 2 of precertification real-time scanning will serve these purposes:

1) Precertification Phase 1 scanning will provide as close as possible to 100 percent mobile NaI detector scanning coverage of the off-property area. The data obtained from this scan will be used to determine patterns of gamma counts and potential hot spots where total uranium, radium-226 or thorium-232 exceed three times (3x) the FRL throughout the surface soil of A9PII. HPGe measurements and hand held frisker measurements will be obtained in areas that are inaccessible to the mobile NaI detectors. Based on this information and other relevant factors as discussed in Section 3.3.3.2 of the SEP, CU boundaries will be established in A9PII according to the criteria for establishing off-property CUs (see Section 1.1 of this PSP).

2) During Precertification Phase 2, a minimum of one HPGe reading will be obtained within each identified CU to confirm the mobile NaI detector highest readings obtained during Precertification Phase 1 by quantifying surface soil concentrations of resolvable primary COCs. The HPGe reading(s) will take place at the locations of highest gamma counts. If the HPGe results show concentrations to be below the FRLs of primary radiological ASCOCs at the point of highest gamma counts, then the assumption can be made that the points of lower gamma counts are also below the FRL based on known contamination patterns. HPGe readings will also be obtained to confirm any location(s) where potential hot spots were identified during Precertification Phase 1. If confirmed, the hot spot will be delineated and removed.

As a whole, precertification data will be used to determine if A9PII is ready for certification activities. If data indicate ASCOC concentrations are low enough to likely pass certification statistical analysis, then certification sampling will be initiated under a separate PSP. If not, an excavation plan will be developed to delineate and excavate the contaminated soil appropriately prior to the initiation of certification activities.

1.3 SCOPE

The scope of this PSP is limited to precertification scanning activities within A9PII. All precertification scanning activities will be consistent with Sections 3.3.3 and 4.5 (Approach E) of the SEP, while taking

additional conservative measures to account for the concerns of the property owner. Details of the real-time scanning approach must be consistent with the User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site (hereinafter referred to as the User's Manual). Field activities must be consistent with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), and Data Quality Objectives (DQO) SL-056, Rev. 0 (Appendix A). All scanning will be conducted using real-time gamma detectors.

1.4 KEY PERSONNEL

Key personnel responsible for performance of the project are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Robert Janke	Kathi Nickel
Area Project Manager	Eric Woods	Jyh-Dong Chiou
Characterization Lead	Lisa Ludwick	Jenny Vance
RTIMP Manager	Joan White	Dave Allen
RTIMP Field Lead	Brian McDaniel	Dave Allen
Surveying Lead	Jim Schwing	Jim Capannari
Data Management Contact	Jenny Vance	Susan Marsh
WAO Contact	Linda Barlow	Christa Walls
Quality Assurance Contact	Reinhard Friske	Mary Eleton
Safety and Health Contact	Debra Grant	Phil Thomas/ Jeff Middaugh

FACTS - Fernald Analytical Customer Tracking System
RTIMP - Real Time Instrumentation Measurement Program
SED - Sitewide Environmental Database
WAO - Waste Acceptance Organization

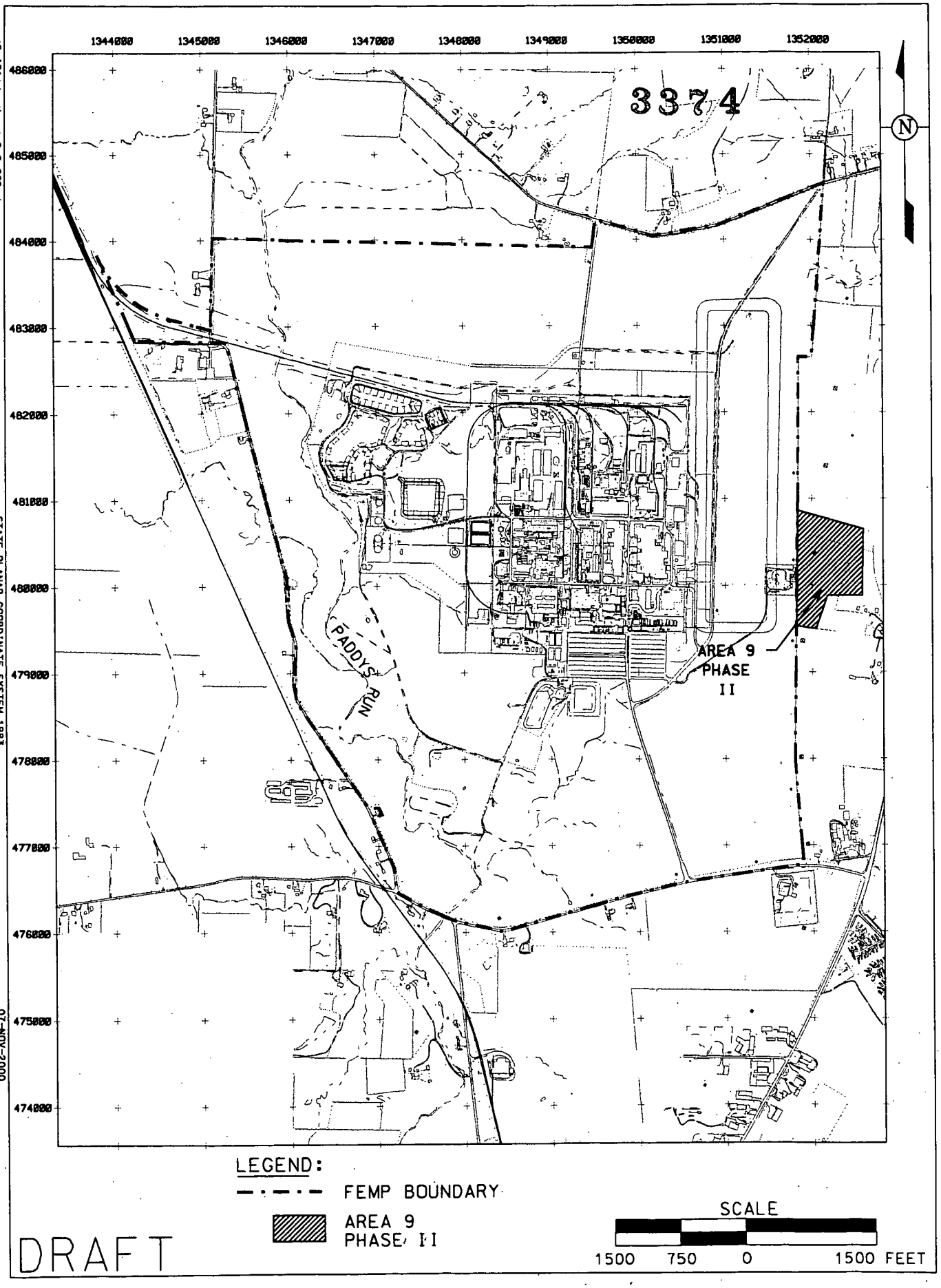
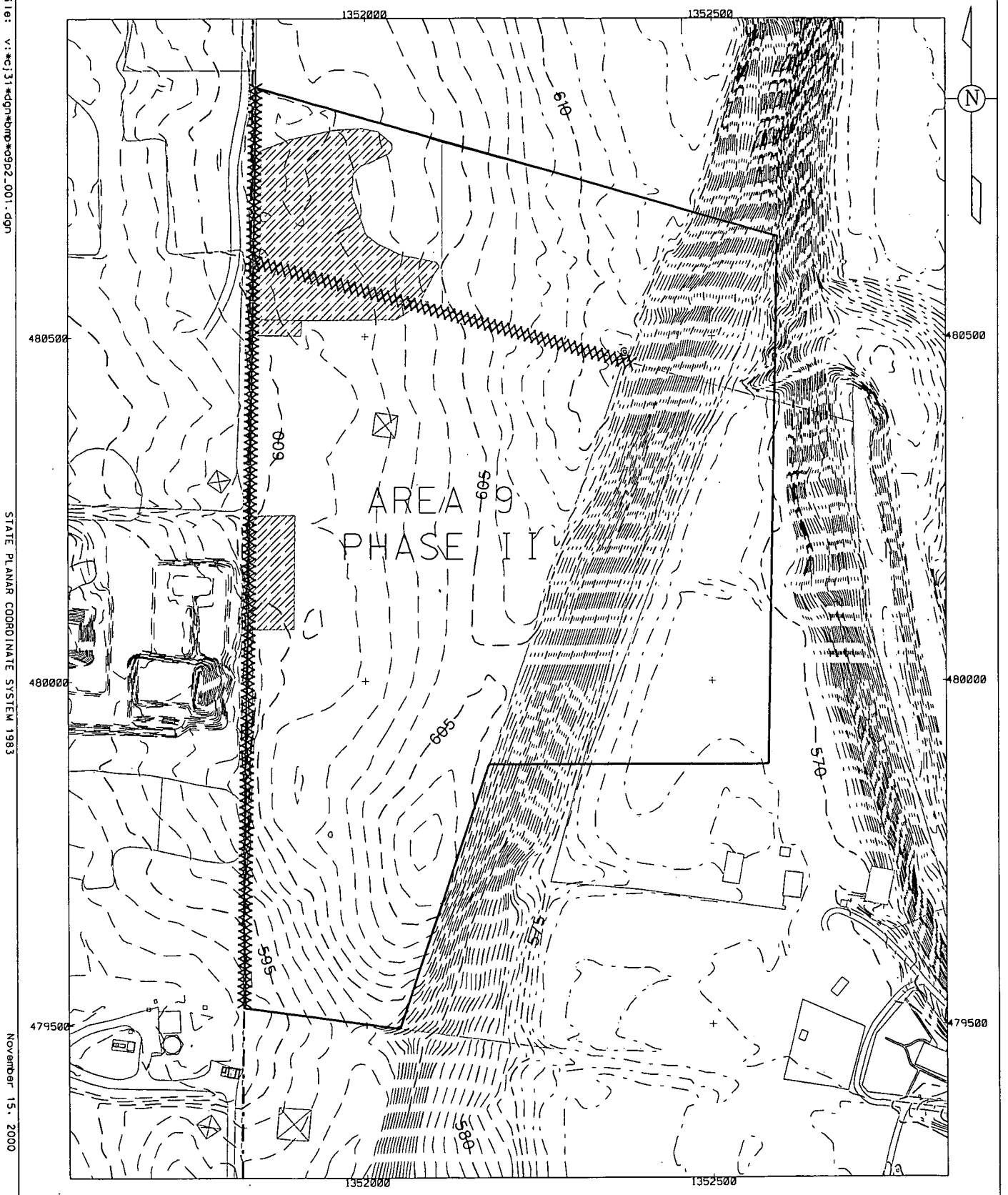


FIGURE 1-1. AREA 9, PHASE II LOCATION MAP



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STATE PLANAR COORDINATE SYSTEM 1983

November 15, 2000

FIGURE 1-2. A9PII TOPOGRAPHY, EXCAVATED AREAS AREAS INACCESSIBLE TO MOBILE NaI SYSTEMS

2.0 PRECERTIFICATION SCANNING PROGRAM

Before beginning precertification scanning activities on private property, the proper access agreements must be obtained from the property owner. The real-time precertification investigation of A9PII will take place in two phases. During Precertification Phase 1, the mobile NaI Radiation Measurement Systems (RMS) will be used to provide as close as possible to 100 percent coverage of the area to determine patterns of gross gamma counts, as discussed later in Section 2.1. RMS operation will be performed in accordance with procedure EQT-41, Radiation Measuring Systems. In areas that are physically inaccessible to the mobile NaI detectors (Figure 1-2), HPGe measurements will be taken to obtain as close to 99.1 percent coverage of the area as possible. Due to wooded or sloped conditions of the area, resulting in its inaccessibility with the mobile NaI detectors, 100 percent coverage of the area is not possible. If the area is inaccessible with the HPGe, then radiological control technicians will perform monitoring with friskers to identify the presence of any radiological (uranium) contamination in the soil or on any debris present. If the friskers identify any areas of concern, then the HPGe will be used to scan that particular area, if accessible. HPGe detector operation will be consistent with procedure EQT-23, Operation of High Purity Germanium Detectors. Hand held frisker operation will be consistent with procedure 602-1030, Performing Contamination Surveys. Information obtained through the NaI scan will be considered when establishing CU boundaries within A9PII.

Based on these Precertification Phase 1 results, HPGe detectors will be used during Precertification Phase 2 to evaluate concentrations of the primary ASCOCs. A minimum of one HPGe reading will be obtained in each planned CU, as established by the Characterization Lead. Specific HPGe measurement locations will be based on the highest NaI gross counts data obtained during the NaI scan. HPGe detectors will be used to characterize areas, as defined later in Sections 2.1 through 2.3. System calibration activities for HPGe detectors will be performed in accordance with procedure EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration. Soil moisture content measurements and background radon measurement will also be collected to support the HPGe measurements, as discussed later in Sections 2.4 and 2.5, respectively.

2.1 PRECERTIFICATION PHASE 1

Gross gamma counts surveying will consist of maximum possible coverage of A9PII using real-time screening with gamma sensitive NaI detector systems. Real-time NaI detector system coverage will be limited to the surface soil and will be as extensive as possible without jeopardizing worker safety or

destroying root systems of trees and shrubs. The mobile NaI detectors acquisition time will be set to four seconds, and data will be collected at a speed of 1.0 mile per hour. Adjacent passes will be conducted with a 0.4-meter overlap, which corresponds to a separation of the centerline of the passes by 2 meters. The Radiation Tracking System (RTRAK) will be the primary tool used to collect surface soil gross gamma counts data. The detector system configuration and performance of all RMS used will be equivalent. The onboard Global Positioning System (GPS) will be used to obtain positioning information for each detector measurement.

In areas that are physically inaccessible, due to vegetation or topography of the area, by the mobile NaI detectors, HPGe measurements will be taken to obtain as close as possible to 99.1 percent coverage of the area. Due to the wooded or sloped conditions of the inaccessible area, 100 percent coverage is not possible. If the HPGe is used, readings will be obtained at a detector height of 1 meter and a count time of 900 seconds (15 minutes). If the HPGe identifies a total uranium, thorium-232 or radium-226 concentration greater than the FRL when set at the 1-meter height, additional readings may be obtained for further investigation at that location. Additional readings for confirmation or delineation will be obtained as described later in sections 2.2.1 and 2.2.2. In areas that are inaccessible with the HPGe, radiological control technicians will perform monitoring with friskers to determine if there is any radiological (uranium) contamination in the soil or on any debris present. If the friskers identify any areas of concern, the HPGe will be used to scan that particular area, if accessible.

Also conducted as part of Phase I, continuous HPGe measurements will be obtained along the property fence line and along the tree line in the northern portion of A9PII, beginning at the top of the slope and extending to the northwest to the FEMP property line (Figure 1-2). The fence line scan is being conducted to further investigate the off-property area adjacent to the STP and the excavated areas in A1PII along the property fence line. The tree line scan is being conducted to determine the effect, if any, of the tree line on airborne contamination, and to obtain additional data from a portion of the RA14 excavated area.

The data obtained from Precertification Phase 1 scanning will be used to determine patterns of gross gamma counts in A9PII. In addition, a two-point moving average of consecutive mobile NaI detector measurements will be mapped to determine if any total uranium, radium-226 and/or thorium-232 hot spots (concentrations greater than 3x FRL) are present. The area(s) of highest gross counts and all

potential hot spots, as identified during Precertification Phase 1, will be confirmed during Precertification Phase 2.

Information obtained through the Precertification Phase 1 will be considered when determining CU boundaries in A9PII, along with other information discussed in Section 3.3.3.2 of the SEP. CU delineation will also follow the criteria for establishing off-property CUs described in Section 1.1. The number of CUs may be increased based on patterns of gross gamma counts. For example, in the unanticipated event that an area of higher counts is identified at an off-property location planned for a Group 2 CU (i.e., more than 250 feet from the fence line or immediately adjacent to the fence line where no excavation took place), the area will be re-designated as Group 1 CUs. The Characterization Lead is responsible for defining CU boundaries and documenting this decision in the CDL for A9PII.

2.2 PRECERTIFICATION PHASE 2

2.2.1 Confirming Highest RTRAK Readings/Hot Spots

Precertification Phase 2 Readings will be obtained to confirm the highest NaI gross counts readings, along with any hot spots (i.e., NaI two-point moving average results above 3x FRL) identified during Precertification Phase 1. To confirm the highest NaI readings, at least one HPGe reading will be obtained in the vicinity of the highest gross gamma counts within each established CU. If the data reveal several areas of higher counts, a corresponding number of HPGe readings will be obtained within a CU. If no area of highest gross gamma counts is identified, the HPGe reading will be obtained at the center of the CU. The number of HPGe measurements and their locations will be determined by the Characterization Lead, considering the consequences of decision errors identified in DQO SL-056. To confirm any hot spots, the HPGe measurement will be made at the location of the maximum result where the NaI two-point average was greater than 3x FRL. A duplicate HPGe measurement must be obtained for every 20 HPGe measurements obtained.

Per guidelines established in Section 3.3.2 of the User's Manual, all Precertification Phase 2 readings will be obtained at two different detector heights: 31 cm (1 foot) and 1 meter. The HPGe detector system acquisition time will be set to 15 minutes for both readings. All HPGe measurement locations will be surveyed and marked with the measurement location as identified in Section 2.2.1. The Precertification Phase 2 HPGe Target Analyte List (TAL) is shown in Table 2-1. A hot spot is confirmed if a HPGe measurement at either detector height exceeds 2x FRL for any ASCOC.

2.2.2 Delineating Hot Spots

If a hot spot (a result above 2x FRL) is confirmed in A9PII, it will be delineated for excavation using the HPGe at a detector height of 15 cm. The results of the 1 m and 31 cm HPGe readings at the hot spot along with surrounding real-time results will affect how the delineation is carried out; however, the strategy must be consistent with guidelines documented in Section 3.3.3 of the User's Manual. If necessary, details of the hot spot delineation will be documented in a Variance/Field Change Notice (V/FCN).

2.3 HPGe MEASUREMENT IDENTIFICATION

Supplemental HPGe readings obtained during Precertification Phase 1 (those collected in areas inaccessible to the NaI systems) will be identified as follows: The HPGe measurement numbering format will consist of a prefix designating the area name (A9P2, note that a numerical "2" is used in place of the roman numeral "II" for data management purposes), followed by letters designating the purpose ("P1" for Precertification Phase 1), followed by a number representing the surveyed acre in which the reading was obtained (1 through x), followed by the reading number within in the area (1 through x), followed by a letter designating the type of sample ("G" for Gamma). For example, A9P2-P1-2-4-G is the fourth gamma reading obtained in the second identified acre of A9PII. If a second reading at a detector height of 31 cm is necessary during Phase 1 [due to a total uranium result >50 milligrams per kilogram (mg/kg)], the reading number will include the letter A. So if the above sample required a second reading, it would be identified as A9P2-P1-2-4A-G. The acres in A9PII will be identified and numbered, and this information will be documented in a V/FCN before the precertification scan begins.

HPGe readings obtained during Precertification Phase 2 will be identified as follows: The HPGe measurement numbering format will consist of a prefix designating the area name (A9P2, again, a numerical "2" is used in place of the roman numeral "II" for data management purposes), followed by letters designating the purpose ("P2" for Precertification Phase 2), followed by a CU number (01 through x), followed by the location number within in the CU (1 through x), followed by a letter designating the type of sample ("G" for Gamma). For example, A9P2-P2-02-1-G is the first gamma reading obtained in the second identified CU of A9PII. If HPGe readings are obtained for hot spot delineation, the sample identification scheme will be identical, but the purpose will be identified as AHS

(for hot spot delineation) instead of A9P2. A duplicate HPGe measurement must be obtained for every 20 HPGe measurements obtained.

2.4 SURFACE SOIL MOISTURE GAUGE MEASUREMENTS

The Troxler® Moisture/Density Gauge or the Zeltex® Infrared Moisture Meter will be used to obtain soil moisture content measurements according to procedures EQT-32 and EQT-39, respectively. These measurements will be used to correct the real-time data so the readings are representative of environmental conditions. Surface moisture measurements will be obtained at a minimum of two per acre where the mobile NaI detectors were used for the Precertification Phase 1 scan. When the HPGe is used during precertification, one surface moisture measurement will be obtained per HPGe reading. All surface moisture gauge measurements will be conducted within eight hours of collecting the real-time measurements. Technicians cannot collect Troxler® measurements simultaneously with the mobile NaI or HPGe measurements because internal radioactive sources contained in the Troxler® moisture gauge can cause interference with these measurements; however, the Zeltex® Infrared Moisture Meter can be used along side these detectors.

2.5 BACKGROUND RADON MONITORING

A background radon monitor (i.e., a HPGe unit) will be utilized during the collection of NaI and HPGe measurements to obtain background radon information from the time that data collection begins until after the final measurement is completed. The monitor will be placed in one location for the day, where it will be set at the same height as the detector being used to collect the soil radiation measurements (NaI detector height = 31cm). The background radon data will be used per Section 5.3 of the User's Manual to correct the radium-226 data.

2.6 DATA MAPPING

As the measurements are acquired by the Survey and RTIMP Teams, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps will be generated for the RTIMP and A9PII Characterization Lead or designee. Maps will be generated depicting the following, unless otherwise specified by the Characterization Lead or designee:

Surface Scan Coverage Map(s)

- NaI Location Map (colored squares) – indicating batch numbers
- NaI Total Activity Map (single spectra coverage) – to determine CU boundaries
- COCs Concentrations Maps – total uranium, radium-226, thorium-232 (2 point running average to determine potential hot spots exceeding 3xFRL) depicting, 2xFRL, and 3xFRL concentrations. Total uranium concentrations will also be depicted at 0.5xFRL.
- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement.

(Note: HPGe location map can be combined with the previous maps if needed)

HPGe Confirmation/Delineation Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement

Hot Spot Post Removal Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) – including summary data printout for each HPGe measurement

2.7 PHYSICAL SAMPLES

No physical soil samples are planned for collection under this PSP. A separate PSP will be developed if it is determined that the collection of precertification physical samples in A9PII is necessary. If physical samples are needed to verify the HPGe readings at the request of the Characterization Lead, the locations, depths, sample numbers, collection methods, analytical requirements and QC requirements will be identified on a V/FCN. If collected, physical samples will follow the data quality objectives identified in DQO SL-048.

2.8 WASTE DISPOSITION

Because no wastes are anticipated to be generated during the real-time scan, a Project Waste Identification Document (PWID) will not be prepared to support field activities under this PSP.

TABLE 2-1
TARGET ANALYTE LIST FOR
A9PII PRECERTIFICATION PHASE 2 HPGe SCANNING

HPGe Detector Scanning		
1	ASL B*	Total Uranium (FRL = 50 mg/kg)
2	ASL B*	Thorium-232 (FRL = 1.4 pCi/g)
3	ASL B*	Radium-226 (FRL = 1.5 pCi/g)

pCi/g - picoCuries per gram

* The Analytical Support Level (ASL) applies only to Precertification Phase 2 readings. All HPGe and mobile NaI readings obtained during Precertification Phase 1 will be classified as ASL A.

Precertification Scanning

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

3.1 QUALITY CONTROL MEASUREMENTS

In accordance with DQO SL-056, Rev. 0 (Appendix A), all Precertification Phase 1 mobile NaI and HPGe measurements will be classified as ASL A. Precertification Phase 2 HPGe measurements will be classified as ASL B. Per the User's Manual, duplicate readings will be taken at 1 for every 20 measurements.

3.2 PROJECT REQUIREMENTS FOR SURVEILLANCES

Project management has ultimate responsibility for the quality of the work processes and the results of the scanning activities covered by this PSP. The FEMP Quality Assurance (QA) organization may conduct independent assessments of the work process and operations to assure the quality of performance. The assessment encompasses technical and procedural requirements of this PSP and the SCQ. Independent assessments may be performed by conducting surveillances.

3.3 FIELD CHANGES TO THE PSP

If field conditions require changes or variances, written approval must be obtained from the Project Lead and QA before the changes may be implemented (electronic mail is acceptable). Changes to the PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA must receive the completed V/FCN, with the signatures of the Project Manager, Characterization Lead and the QA Representative, within seven working days of granting approval.

3.4 APPLICABLE PROCEDURES, MANUAL AND DOCUMENTS

Work performed under this PSP will be conducted in accordance with the following procedures:

- 602-1030, Performing Contamination Surveys
- ADM-02, Field Project Prerequisites
- EQT-05, Geodimeter 4000 Surveying System - Operation, Maintenance, and Calibration
- EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23, Operation High Purity Germanium Detectors

- EQT-32, Troxler® 3440 Series Surface Moisture/Density Gauge-Calibration, Operation, and Maintenance
- EQT-33, Real-time Differential Global Positioning System Operation
- EQT-39, Operation of the Zeltex® Infrared Moisture Meter
- EQT-41, Radiation Measuring Systems
- FD-1000, Sitewide CERCLA Quality Assurance Project Plan (SCQ)
- Sitewide Excavation Plan (SEP)
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site (User's Manual)

4.0 HEALTH AND SAFETY

Technicians will conform to precautionary surveys performed by personnel representing Industrial Hygiene and Radiological Control as applicable. All work performed on this project will be performed according to applicable EM procedures, RM-0020 (Radiological Control Requirements Manual), RM-0021 (Safety Performance Requirements Manual), Fluor Fernald work permit, Radiological Work Permit (RWP), and other applicable permits. Concurrence with applicable safety permits is required by each technician in the performance of their assigned duties. A safety briefing will be conducted prior to the initiation of field activities.

All emergencies shall be reported immediately on extension 911, or to the Site Communications Center at 648-6511 (if using a cellular phone), or by using a radio and contacting "CONTROL" on Channel 11.

5.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the investigation will be properly managed following completion of the field activities. As specified in Section 5.1 of the SCQ, daily activities will be recorded on the Field Activity Log, with sufficient detail to be able to reconstruct a situation. At least weekly, a copy of all field logs will be sent to the Characterization Lead.

Electronically recorded data from the GPS, HPGe, and NaI systems will be downloaded from the field computers on a daily basis or as the project requires. Geodimeter data may be transferred to the Data Management Contact via email. Technicians or the Surveying Lead will review the data for completeness and accuracy and then download it onto the Local Area Network (LAN). Once on the LAN, the Data Management Contact within the Soil and Disposal Facility Project will perform an evaluation, then transfer the data into a useable format. Once complete, the data will be sent to the loader where it will be loaded onto the SED and an error log will be generated. The data will then be made available to users through both the Graphical Information System (GIS) and Microsoft Access Software. Technicians will archive all downloaded data for future reference.

Field documentation, such as the Field Activity Log, Gamma Spectrometry Field Worksheet, Geodimeter Survey Files and the Nuclear Field Density/Moisture Worksheet will undergo an internal QA/QC review by the technicians. Copies will then be generated and will be delivered to the Data Management Contact who will perform an evaluation of the data and create the appropriate links between the electronically-recorded data and the paper-generated data within the SED. Field logs may be completed in the field and maintained in loose-leaf form. Loose-leaf pages will be numbered, and all recordings will be in ink.

APPENDIX A

DATA QUALITY OBJECTIVES SL-056, Rev. 0

3374

Control Number _____

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Final Remediation Level (FRL) Monitoring

Number: SL-056

Revision: 0

Effective Date: 9/01/99

Contact Name: Joan White

Approval: _____ Date: 9/1/99
James Chambers
DQO Coordinator

Approval: _____ Date: 9/1/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	9/01/99						

Data Quality Objectives
Real Time Final Remediation Level (FRL) Monitoring

1.0 Statement of Problem

Conceptual Model of the Site

The general soil remediation process at the Fernald Environmental Management Project (FEMP) includes real-time *in-situ* gamma spectrometry (real-time) measurements and physical sampling during different phases of the remediation process. Initially, pre-design investigations define excavation boundaries. During excavation, real-time measurements and/or sampling for waste disposition issues occurs. After planned excavations are complete, real-time measurements and/or physical sampling precertification activities are carried out to verify that residual contamination is below final remediation levels (FRLs).

This DQO describes the real-time in-situ gamma spectrometry methods used for gamma resolvable Area Specific Contaminants of Concern (ASCOC) FRL monitoring to support remedial design and precertification. Any physical soil samples collected to support remedial design will be collected under a separate DQO. Real-time FRL measurements involve field surveys of the surface soil using mobile and stationary gamma-discernable real-time equipment. Real-time FRL measurements are collected within an area when above-FRL radiological contamination is anticipated to be minimal based on process knowledge or previous investigations.

FRL scanning activities must follow the guidelines established in the *Sitewide Excavation Plan* (SEP) and the most current version of the document *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site* (hereinafter referred to as the Real Time Users Manual). As discussed in these documents, FRL measurements are conducted in two separate activities:

- FRL Phase I includes a mobile sodium iodide (NaI) detector scan of as much of the area as accessible at a 31 cm detection height at 1 mile per hour. If parts of the area of interest are inaccessible to the mobile NaI detectors, then the stationary High Purity Germanium (HPGe) detector will be used to obtain measurements in those areas. Target parameters for FRL Phase I NaI measurements are gross gamma activity and 3-times the FRL (3x FRL) values of total uranium, radium-226 and/or thorium-232, as calculated by a moving two-point average of consecutive measurements, or as indicated by 2x FRL in single measurements using the HPGe detectors at a 1 meter detector height.

- FRL Phase II includes stationary HPGe "hot spot evaluation" measurements at Phase I locations where the two-point average of total uranium, radium-226 and/or thorium-232 has identified resolvable ASCOC concentrations

greater than 3-times the FRL (3x FRL) using the RMS systems, or where single HPGe measurement from Phase I are greater than 2x FRL. Target parameters for FRL Phase II are all gamma resolvable radiological ASCOCs.

Available Resources

Time: FRL investigation of remediation areas or phased areas must be accomplished by the field team of real-time instrumentation operators (and samplers if necessary), to provide required information in time to support the design effort.

Project Constraints: FEMP remediation activities are being performed in support of the Accelerated Remediation Plan, and soil remediation activities must be consistent with the SEP. FRL scanning, and if necessary, sampling and analytical testing, must be performed with existing manpower and instrumentation, considering instrument availability, to support the remediation and certification schedule. The results of FRL Phase I will determine Phase II HPGe measurement location and if necessary, will determine physical sample location. Design and execution of potential remediation is dependent on successful completion of this work.

Instrumentation: Real-time monitoring includes mobile sodium iodide (NaI) systems referred to as the Radiation Measurement Systems (RMS). In addition, stationary germanium detectors mounted on a tripod (the HPGe), are also used. These instruments can significantly accelerate the pace of necessary characterization by detecting soil contaminated with gamma resolvable radiological ASCOCs in a rapid and non-intrusive manner.

2.0 Identify the Decision

Decision

Delineate the horizontal extent of above-FRL (hot spot criteria) radiological contamination in the area soil. In addition, determine the need for Phase II real-time measurements to further assist in the above-FRL delineation.

3.0 Identify Inputs That Affect the Decision

Required Informational Input

Real-time FRL measurements will be used to estimate the surface soil contamination and the variation in surface soil contamination in areas scheduled for design, modeling, precertification, or certification activities. In addition, RTIMP data may be used to determine physical sampling collection location and/or a review of existing physical sample data, process knowledge, or visible observation.

Sources of Informational Input

FRL measurements for gamma discernible radiological COCs will involve measurements from mobile and stationary in-situ gamma spectrometry equipment. Physical samples may be collected to verify real-time measurements, or to investigate non-gamma resolvable ASCOCs.

Action Levels

FRLs established in the OU2 and OU5 Records of Decision are specific for radiological COC, and in some cases, vary between remediation areas. The FRLs were developed to account for health risks, cross media impact, background concentrations, and applicable or relevant and appropriate requirements (ARARs) and represent not-to-exceed contaminant-specific average soil concentrations. Real-time HPGe measurements may also be taken to support excavation to ALARA requirements. Physical samples may be used to verify HPGe readings and to precertify for non-gamma resolvable ASCOCs.

The 3x FRL concentrations/activities obtained through two-point averaging of mobile NaI measurements have been developed based on the ability of the instrumentation to resolve these levels. Refer to the Real-Time User's Manual for additional details.

Methods of Data Collection

FRL Phase I measurements will be utilized to obtain as close to complete coverage of the areas of concern. Hot spot confirmation and delineation measurements will be obtained during FRL Phase II by strategically placed stationary HPGe measurements. Analysis and data management for FRL Phase I data will be conducted at ASL A. FRL Phase II data may be conducted at either ASL A or ASL B, at the discretion of the Project. The decision to collect Phase II data at ASL A, or ASL B will depend on the Project's need for validated data. Only ASL B data is subject to validation, at project request. Real-time data collection for Phase II ASL A and ASL B measurements are identical. All measurements will be performed in compliance with operating procedures, the Real-Time User's Manual, the SEP, and the SCQ.

The FRL Phase I data will be utilized to establish general radiological concentration patterns and detect areas of elevated total gamma activity, as well as provide isotopic information for resolvable ASCOCs. The FRL Phase II HPGe gamma detectors will be used to confirm and delineate Phase I potential hot spot measurements, as needed. All real-time Phase I and Phase II measurements will be collected in accordance with the procedures identified in Section 7.0 of this DQO.

Surface physical samples may be collected to verify HPGe measurements for

non-gamma resolvable ASCOCs. If physical sampling is needed, it will be identified in PSPs. The data quality of these samples will be consistent with the latest sampling DQO.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: Boundaries are limited to surface soils of areas planned for certification, and adjacent areas, as defined in the individual work plans.

Population of Soils: The soils affected are surface soils (to a nominal depth of 6 inches), which include recently excavated surfaces and undisturbed soils associated with excavation areas as designated in the individual work plans.

Temporal Boundaries

Time Constraints on Real-Time Measurements: The scheduling of FRL scanning is closely associated with the design process and excavation schedule. FRL real-time scanning must be conducted prior to design, excavation, if any, and before certification activities begin. The scanning data must be returned and processed into useable format in time for the information to be useful within the current remediation schedule.

Practical Considerations: In-situ gamma spectrometry measurements cannot be made during snow coverage or standing water conditions or during precipitation. Field analytical methods should also be limited to unsaturated soils. Most areas undergoing scanning are flat, open terrain, and are readily accessible to the equipment. Some areas may require preparation, such as cutting of grass or removal of undergrowth, fencing and other obstacles. In situ measurements will require coordination with appropriate maintenance personnel for site preparation. Physical and environmental parameters will be recorded and assessed during data collection. Refer to the Real-Time User's Manual for additional details.

5.0 Develop a Logic Statement

Parameters of Interest

For FRL Phase I, parameters of interest are gross gamma activity and 3-times the FRL values of total uranium, radium-226 and thorium-232, as calculated by a moving two-point average of consecutive readings. For FRL Phase II, parameters of interest are all HPGe-discernable radiological ASCOCs.

FRL Target Levels

For FRL Phase I, target levels are the highest gross gamma activity readings, 3x FRL for total uranium, radium-226 and thorium-232, and WAC trigger levels for total uranium. For FRL Phase II, target levels are the FRLs of all gamma discernable radiological ASCOCs including the WAC trigger level for total uranium.

Decision Rules

Following FRL Phase I, any Phase I NaI scanned areas exhibiting patterns of high gross gamma activity will be measured with the HPGe. Also, any Phase I HPGe measurements greater than 3x FRL will be scanned with the HPGe for hot spot evaluation per section 3.3 of the Real-Time User's Manual.

Following FRL Phase II, if HPGe results indicate an area could fail FRLs, the soil may be evaluated further with additional HPGe measurements or physical samples, or undergo remedial excavations. If remedial excavations are performed, the excavated area will be measured with post-excavation HPGe measurements to ensure removal of the contamination. Once the remediation is complete, FRL attainment is confirmed by the HPGe.

6.0 Establish Constraints on the Uncertainty of the Decision

Range of Parameter Limits

The range of surface soil concentrations anticipated will be from background (natural concentrations) to greater than 3X FRL.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision maker decides an area meets FRLs when the average soil concentration in an area is above the FRL, or the soil contains ASCOC concentrations above the hot spot criteria (3x FRL for hot spots ≤ 10 m^2, or 2x FRL for hot spots > 10 m^2). This decision error would lead to the area failing certification for average radiological COC concentrations above the FRL or for hot spot criteria. If an area fails certification sampling and analytical testing, remobilization and further excavation, precertification, and certification sampling would be necessary.

Decision Error 2: This decision error occurs when the decision maker decides that additional HPGe and/or physical samples are necessary based on FRL Phase II results; or the decision maker directs the excavation (or additional excavation) of soils, when they actually have average radiological COC concentrations below the FRLs and no ASCOC hot spots (3x FRL for hot spots ≤ 10 m^2, or 2x FRL for hot spots > 10 m^2). This would result in added sampling and analytical costs and/or added costs due to the excavation of clean soils and an increased volume in the OSDF. This is not as severe as Decision Error 1. The addition of clean soil to the

OSDF would result in further reduction, although minimally, to human health risk in the remediated areas.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentrations of radiological ASCOCs are greater than their FRLs and/or the hot spot criteria. The true state of nature for Decision Error 2 is that the true concentrations of COCs are below their FRLs and/or hot spot criteria. Decision Error 1 would be the more severe error.

7.0 Optimize a Design for Obtaining Quality Data

As discussed in Section 3.3.3 of the SEP, FRL scanning consists of two separate activities. Refer to Section 1.0 of this DQO for a general overview of FRL Phase I and FRL Phase II activities.

Real-time measurements are generated by two methods: 1) the mobile sodium iodide (NaI) detection systems which provide semi-quantitative radiological data, and 2) the stationary high purity germanium (HPGe) system that provides quantitative measurements of radiological COCs. If necessary, physical samples may also be collected for HPGe data verification, and to precertify for non-gamma resolvable ASCOCs.

Surface moisture readings are obtained in conjunction with Phase I and Phase II the NaI and HPGe system measurements using the Troxler nuclear moisture and density gauge or the Zeltex moisture meter. If conditions do not permit the use of the moisture meters, a soil moisture sample may be collected and submitted to the on-site laboratory for percent moisture analysis, or a default moisture value of 20% may be used. The soil moisture data will be used as is discussed in Sections 3.8, 4.11 and 5.2 of the Real-Time User's Manual. The gamma data will be corrected to a dry weight equivalent.

Background radon monitoring will also occur in conjunction with Phase I and Phase II NaI and HPGe system measurements, as specified in the PSP. Refer to the Section 5.3 of the Real-Time User's Manual for a discussion on radium-226 corrections.

Sodium Iodide (NaI) System

The mobile NaI detector systems are collectively called the Radiation Measurement Systems (RMS). They are used to achieve as close to complete coverage of the area as possible, taking into consideration the topographic and vegetative constraints which limit access. The NaI systems currently are used to obtain measurements over an area specified in a PSP to detect radiological total activity

patterns and elevated radiological activity. The NaI detector systems are used at a 31 cm detector height at 1 mph for a 4 second acquisition with a 0.4 meter overlap, and are consistent with the Real-time User's Manual. If the total uranium FRL is 20 ppm or lower, the NaI systems should not be used for FRL attainment, the HPGe system should be used.

The mobile NaI systems are electronically coupled with a global positioning system (GPS) rover and base unit to record each measurement location. Counting and positioning information is recorded continuously on a field personal computer (PC) and stored on disk or hard drive for future downloading on the site soil database and Graphical Information System (GIS) system, or transferred directly to the Local Area Network (LAN) by Ethernet.

Information from the NaI/GPS system is recorded on the PC and transferred to the Unix system through the local area network on a regular (at least daily) basis. The information is plotted on the FEMP GIS system, or in the field using Surfer software. With the output, patterns of elevated total activity, and locations of elevated concentrations can be identified.

Data reduction is an important aspect of NaI system data use. Individual total uranium, radium-226 and thorium-232 concentrations will undergo two-point averaging. The two-point averaged values will be mapped and evaluated with respect to 3x FRL.

NaI measurements may be used for design, excavation during remediation, and precertification decision making if the measurements clearly indicate below FRL criteria have been met. They may also be used to determine the location and number of FRL Phase II HPGe measurements, if required.

In-Situ HPGe Detectors

The HPGe detector is used during FRL Phase I or FRL Phase II, as follows:

- During FRL Phase I, the HPGe is used in areas where topographic or vegetative constraints prevent mobile NaI detector access or if the NaI systems are out of service. The HPGe is used in a 99.1% coverage grid over the accessible area. Detector height is 1 meter with a count time of 15 minutes.

- During FRL Phase II, the HPGe detector is used at strategic locations established thorough the FRL Phase I screening. These locations are where the highest readings of gross gamma activity were identified and/or where individual ASCOC concentrations were identified as hot spots. The HPGe is used to identify radiological COC levels, which in turn provide information concerning the ability to pass FRLs. The number of Phase II HPGe

measurements to delineate the hot spot boundary varies based on the size of extent of contamination. If the area potentially exceeding the 2x FRL or 3x FRL exhibits a visible contamination boundary, the Project may determine that Phase II measurements may not need to be collected.

Physical Soil Sampling

Physical samples may be collected and analyzed for target radiological COCs to verify the HPGe measurements and/or to precertify for non-gamma discernable ASCOCs. If physical samples are required, they will be collected in compliance with the applicable sampling DQO. Criteria for obtaining physical samples, such as sample density, will be specified in the PSP, if necessary. The minimum data quality acceptable for this purpose will be identified in the applicable sampling DQO. Field QC, ASL and Validation requirements will be consistent with the SCQ and SEP requirements.

Data Quality Objectives
Real Time FRL Measurements

1A. Task/Description: FRL real-time measurements.

1B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-056, Rev. 0 DQO Reference No.: Current Sampling DQO

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☐ Sediment ☒ Soil ☒

Waste ☐ Wastewater ☐ Surface water ☐ Other (specify) _____

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization A ☒ B ☒ C ☐ D ☐ E ☐	Risk Assessment A ☐ B ☐ C ☐ D ☐ E ☐
Evaluation of Alternatives A ☐ B ☐ C ☐ D ☐ E ☐	Engineering Design A ☒ B ☒ C ☐ D ☐ E ☐
Monitoring during remediation activities A ☒ B ☒ C ☐ D ☐ E ☐	Other: Precertfication A ☒ B ☒ C ☐ D ☐ E ☐

4.A. Drivers: Applicable or Relevant and Appropriate Requirements (ARARs), Operable Unit 5 Record of Decision (ROD), the Real-Time User's Manual, the Sitewide Excavation Plan and the Project-Specific Plan (PSP).

4.B. Objective: To determine if the area of interest is likely to pass FRLs for all HPGe discernable radiological COCs

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5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FEMP that require remediation activities. The RODs specify that the soils in these areas will be clean and demonstrated to be below the FRLs.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1.	pH	☐	2.	Uranium	☒*	3.	BTX	☐
	Temperature	☐		Full Rad.	☒*		TPH	☐
	Spec.Conductance	☐		Metals	☐		Oil/Grease	☐
	Dissolved Oxygen	☐		Cyanide	☐			
	Technetium-99	☐		Silica	☐			
4.	Cations	☐	5.	VOA	☐	6.	Other (specify)	
	Anions	☐		ABN	☐		Percent Moisture	
	TOC	☐		Pesticides	☐			
	TCLP	☐		PCB	☐			
	CEC	☐						
	COD	☐						

* If specified in the PSP for NaI and HPGe detectable rad's.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Mobile NaI, HPGe and HPGe*	SCQ Section: Not Applicable
ASL B HPGe*	SCQ Section: App. G , Table 1
ASL C _____	SCQ Section: _____
ASL D _____	SCQ Section: _____
ASL E _____	SCQ Section: _____

* Choosing the ASL level for Phase II FRL HPGe measurements is at the discretion of the project considering the project need for validated data.

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [ ] Grab [X] Grid [X]

Intrusive [ ] Non-Intrusive [X] Phased [ ] Source [ ]

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the Project-Specific Plans.
Background samples: OU5 RI/FS

7.C. Sample Collection Reference:
-EQT-22, *Characterization of Gamma Sensitive Detectors*
-EQT-23, *Operation of High Purity Germanium Detectors*
-EQT-32, *Troxler 3440 Series Surface Moisture Gauge*
-EQT-33, *Real Time Differential Global Positioning System*
-EQT-39, *Zeltex Infrared Moisture Meter*
-EQT-40, *Satloc Real-time Differential Global Positioning System*
-EQT-41, *Radiation Measurement Systems*
-ADM-16, *In-Situ Gamma Spectrometry Quality Control*
-User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[ ]	Container Blanks	[ ]
Field Blanks	[ ]	Duplicate Samples	[X]*
Equipment Rinsate Samples	[ ]	Split Samples	[ ]
Preservative Blanks	[ ]	PE Samples	[ ]

Other (specify) Radon Monitoring, moisture *
* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

Method Blank	[ ]	Matrix Duplicate/Replicate	[ ]
Matrix Spike	[ ]	Surrogate Spikes	[ ]

Other (specify) _____

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9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.